Hg-Cu-BEARING METAL-SULFIDE ASSEMBLAGE IN THE H3 CHONDRITE TIESCHITZ: IMPORTANT CARRIERS OF PRISTINE Hg AND POSSIBLY Cd-ISOTOPIC SIGNATURES IN THE EARLY SOLAR SYSTEM.

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Introduction: Here we report the study of a unique assemblage consisting of metallic Hg, cinnabar (HgS), native Cu and covellite (CuS) in the matrix of the Tieschitz H3 chondrite [1]. This finding allows for the first time to determine the isotopic abundance of the Hg isotopes both in matrix and chondrules. HgS is also the potential carrier of CdS. CdS should also allow accurate scrutiny of the isotopic signatures of Cd in chondrules and matrix [2, 3]. Hg- and Cu-sulfides occur mostly as alternating layers of cauliflower-like objects. Nanometer-sized native Hg spherules occur in spongy metallic Cu and within HgS and Cu-sulfides. Native Cu is mostly polycrystalline fine-grained aggregates.

Results and Implications: Our findings of HgS-Cu-sulfide-metallic Hg coexisting with native Cu leads to important consequences. This setting clarifies the origin of Cu in chondritic metal and refutes the claimed origin by impact melting [4]. The polycrystalline textures rather indicate that native Hg was possibly sequestered in the spongy Cu grains before accretion hence in a closed system that preexisted in the matrix and accreted at very low temperature at the surface of the parent body under little thermal annealing. Native Cu associated with Ni-poor kamacite in large rim around clast or in chondrule is barren of Hg mineral and must have formed through another process [5]. These two different modes of formation suggest different nebular sources for matrix and chondrules in Tieschitz. Systematic coexistence as native metal and sulfides implies co-genetic relationship between Cu and Hg and cast considerable doubt on the proposed enrichment in Hg minerals by condensation of Hg (and the volatile Cd) interpreted as sublimated from the hotter asteroid interior and re-condensed in the outer colder regions [6, 7]. This scenario [7] implies a common source for HgS, Hg, on the one hand and CuS, native Cu and the more refractory nano inclusions of olivine and phosphates inside cinnabar on the other hand from the asteroid interior. This model is also discrepant with the observation that Hg-bearing assemblages are confined to the matrix and no Cd phases were found [7], The claimed co-sublimation of Hg, Cd and Cu sulfides and their simultaneous re-condensation only in matrix, the occurrence of spongy Cu with nano inclusions in HgS, Cu-sulfide or native Cu, absence of FeS or Fe-oxides are in conflict with a parent body remobilization-condensation scenario of opaque assemblages. Our findings are not in conflict with a scenario of sulfidation in a reservoir of strictly non-solar composition in the nebula.

References: [1] Caillet Komorowski C. et al. 2009 *Meteoritics & Planetary Science* 44:A112. [2] Rosman et al. 1980, *Earth and Planetary Science Letters* 48:166-170. [3] Moser et al. 2003. [4] Rubin A.E. 1994. *Meteoritics* 29:93-98. [5] El Goresy, A. 2006. *Meteoritics & Planetary Science* 41:A204; [6] Dreibus, G. and Wänke, H. 1980. *Meteoritics* 15:284-285. [7] Wombacher F. et al. 2003. *Geochimica & Cosmochimica Acta*, 67: 4639-4654.